

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 27 APR 2005

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Applicant's or agent's file reference NSP/P89357PWO	<b>FOR FURTHER ACTION</b> See Form PCT/PEA/416	
International application No. PCT/GB2004/001511	International filing date (day/month/year) 07.04.2004	Priority date (day/month/year) 15.04.2003
International Patent Classification (IPC) or national classification and IPC B01D53/00, B01D5/00, B01D53/26		
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- This report is the International preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
  - ☒ sent to the applicant and to the International Bureau) a total of 5 sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☒ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - ☐ (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

Date of submission of the demand  11.11.2004	Date of completion of this report  28.04.2005
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  Bogaerts, M  Telephone No. +31 70 340-2335 

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/001511

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4)
- ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-31 as originally filed

**Claims, Numbers**

1-33 received on 15.02.2005 with letter of 15.02.2005

**Drawings, Figures**

1-17 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☒ the claims, Nos. 1,2
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	3-33
	No: Claims	1,2
Inventive step (IS)	Yes: Claims	
	No: Claims	1-33
Industrial applicability (IA)	Yes: Claims	1-33
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item I:**

The addition of "and adjacent to condensate formed from the condensing gas" in claims 1 and 2 has no basis in the originally filed application documents.

The general statements in the description on pages 2 (paragraph 3), 6 (paragraph 2), 11 (paragraphs 1 and 3) and 12 (paragraph 2) do not unambiguously provide such a basis.

**Re Item V:**

Reference is made to the following documents:

D1: EP-A-0553706

D2: EP-A-0856714

1. Documents D1 and D2 disclose a process and a condenser for condensing a gas to liquid. Means are provided for the withdrawal of non-condensing gases from within the condenser at a region where the temperature is lower than in other regions within the condenser.

The subject-matter of claims 1 and 2 therefore lacks novelty (Art. 33(2) PCT).

Even if the unallowable amendments (Item I) would have been taken into account D1 and D2 would still have been novelty destroying for claims 1 and 2 because the non-condensing gas is in fact withdrawn from a location "adjacent" (which is an unclear term) to condensate formed from the condensing gas.

2. Dependent claims 3-21 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, the reasons being as follows:  
The additional technical features are directly derivable from the prior art or are obvious alternatives.
3. In view of the lack of conciseness and the lack of clear technical features (see Box VIII) it is not at present clear whether an additional problem has been solved by any of the independent claims 22,23,27,28,32 and 33 and their respective dependent claims.

**Re Item VIII:**

1. Although claims 1,2,22,23,27 and 28 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.
2. Claims 32 and 33 contain reference to the description and/or the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

CLAIMS

1. A method for removing non-condensing gas from a mixture of condensing and non-condensing gases in a condenser, wherein gas is withdrawn from at least one location within the condenser, the location being selected to correspond to a region within the condenser in which the gas is at a temperature which is lower than the temperature of gas in other regions within the condenser and adjacent to condensate formed from the condensing gas.
2. A condenser for condensing gas in which gas is condensed to liquid on a heat exchanging surface, comprising means for withdrawing gas from within the condenser to remove non-condensing gas, the gas withdrawing means being positioned to withdraw gas from at least one location in which the gas temperature is lower than in other regions within the condenser and adjacent to condensate formed from the condensing gas.
3. A condenser according to claim 2, wherein the gas withdrawing means comprises cooling means for producing a localised region of relatively cold gas in the location from which gas is withdrawn.
4. A condenser according to claim 3, wherein the cooling means comprise a heat exchanger on which gas condenses.
5. A condenser according to claim 3 or 4, wherein the cooling means comprises means positioned to be cooled by condensing liquid.
6. A condenser according to claim 5, wherein the cooling means comprises at least one deflector located beneath the heat exchanging surface such that droplets of liquid fall onto and cool the deflector, the gas withdrawing means extracting air from beneath the deflector.
7. A condenser according to claim 6, wherein the or each deflector is a cover extending over an upwardly extending gas withdrawal pipe.

8. A condenser according to claim 6, wherein the or each deflector is an elongate gas withdrawal duct a lower side of which defines apertures through which gas is withdrawn into the elongate duct.
9. A condenser according to claim 6, wherein the or each deflector is an elongate duct an underside of which defines an open channel, the gas withdrawing means being connected to one end of the elongate duct.
10. A condenser according to claim 8 or 9, wherein the elongate duct extends beneath and in parallel with a heat exchanger tube of the condenser.
11. A condenser according to claim 6, 7, 8, 9 or 10, wherein a shield is located above the or each deflector to shield falling droplets of condensate from gas flowing through the condenser.
12. A condenser according to claim 3, wherein the cooling means comprises a surface which is cooled by a flow of coolant.
13. A condenser according to claim 12, wherein the surface of the cooling means is cooled by a flow of coolant to a temperature lower than any heat exchange surface within the condenser.
14. A condenser according to claim 12, wherein the cooling means comprises primary and secondary heat exchangers both defining heat exchange surfaces, the heat exchange surface of the primary heat exchanger being located upstream of the heat exchange surface of the secondary heat exchanger in the flow of gas to be condensed, and the secondary heat exchanger being cooled to a lower temperature than the primary heat exchanger.
15. A condenser according to claim 14, wherein the primary and secondary heat exchangers are cooled by flows of coolant derived from separate sources, the coolant

of the secondary heat exchanger being at a lower temperature than the coolant of the first heat exchanger.

16. A condenser according to any one of claims 2 to 15, comprising an auxiliary heat exchanger within the condenser, and means for pumping condensed liquid through the auxiliary heat exchanger, the auxiliary heat exchanger being located such that the condensed liquid within it is heated by the gas to be condensed.

17. A condenser according to claim 16, wherein the auxiliary heat exchanger is located upstream of the said heat exchanging surface in the flow of gas to be condensed.

18. A condenser according to claim 12, wherein the cooled surface is defined by a pool of condensed liquid in thermal contact with a cooling device.

19. A condenser according to claim 12, wherein the cooled surface is defined by a wall of the condenser in thermal contact with a cooling device.

20. A condenser according to claim 19, wherein the condenser wall is defined by a cover plate which covers an aperture in the condenser, gas being withdrawn through the cover plate.

21. A condenser according to claim 20, comprising means for monitoring the pressure and temperature of gas adjacent the cover plate, and means for controlling the cooling means to maintain the temperature of the cover plate above the freezing point of the condensed liquid.

22. A method for establishing favourable temperature differences between heat exchanger conduits within a condenser and a process fluid which flows through the condenser, wherein coolant is pumped through an array of parallel heat exchanger conduits spaced apart in the direction of process fluid flow, at least two of the conduits being connected in series such that coolant flows sequentially through first

and second conduits, the second conduit being located upstream of the first conduit in the direction of process fluid flow.

23. A condenser comprising an array of parallel heat exchanger conduits spaced apart in the direction of flow of a process fluid flow including a gas to be condensed, wherein at least two conduits that are spaced apart in the direction of fluid flow are connected in series such that coolant flows sequentially through first and second conduits, the second conduit being located upstream of the first conduit in the direction of process fluid flow.
24. A condenser according to claim 23, wherein a first pair of first and second conduits are connected in series, a second pair of first and second conduits are connected in series, the direction of flow of coolant through the condenser being in one direction for the first conduit of the first pair and the second conduit of the second pair and in the opposite direction for the second conduit of the first pair and the first conduit of the second pair, the second conduit of the first pair being located upstream in the process flow of the first conduit of the second pair, and the second conduit of the second pair being located upstream in the process flow of the first conduit of the first pair.
25. A condenser according to claim 23 or to claim 24, wherein the parallel heat exchanger conduits comprise parallel heat exchanger tubes.
26. A condenser according to claim 23, wherein the parallel heat exchanger conduits are defined by a staggered array of baffles, each baffle extending transverse the direction of flow of the process fluid, with alternate baffles extending from opposite sides of the condenser, the condenser further comprising an array of process fluid tubes extending through the baffles for said flow of the process fluid.
27. A method for minimising the pressure within a containment vessel resulting from the release into the vessel of a pressurised gas which will condense to a liquid at the temperatures and pressures assumed to prevail within the containment vessel,

wherein a body of the liquid of large surface area relative to the area of the vessel is established in a lower portion of the vessel.

28. A containment vessel intended to contain a release into the vessel of pressurised gas which will condense to a liquid at the temperatures and pressures assumed to prevail within the containment vessel, the containment vessel initially being filled with a gas or gases which will not condense at the temperatures and pressures assumed to prevail within the containment vessel, and the containment vessel including means for establishing in a lower portion of the vessel a body of the liquid of large surface area relative to the area of the vessel.

29. The containment vessel according to claim 28, comprising at least one open tray arranged to collect condensing liquid to form the said body of liquid.

30. A containment vessel according to claim 28, comprising means for releasing a stored volume of the liquid into at least one open tray to form the said body of liquid.

31. A containment vessel according to claim 30, comprising means for sensing pressure within the containment vessel, and means for releasing the stored volume of liquid in the event of the sensed pressure exceeding a predetermined threshold.

32. A condenser substantially as hereinbefore described with reference to any one or more of Figures 8 to 15 and 17.

33. A containment vessel substantially as hereinbefore described with reference to Figure 16.